Development of New Rocket Engine Liner Materials Based on Copper Alloys with Diamond Particle Additions

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Abstract

Novel copper-diamond materials containing particulate dispersions of diamond within a copper alloy matrix have been produced as next-generation rocket engine combustion chamber liner materials. These Copper-Diamond composite materials have significantly higher thermal conductivity than conventional liner materials and have the potential to increase the engine performance significantly. Liner fabrication techniques include hot pressing and spark plasma sintering, which are capable of scale up to full-size production parts. The materials have been evaluated for thermal cycling resistance and ease of manufacturing. The results indicate great promise of these materials and associated economics to replace state-of-the-art combustion chamber liner materials such as GRCop-84 and NARloy-Z. Novel combustion chamber fabrication processes are discussed, including cladding the liner with jacket materials.